

REMARKS/ARGUMENTS

Favorable reconsideration of the present application is respectfully requested.

The courtesy extended by the Examiner in conducting a personal interview with the undersigned attorney on February 19, 2004, is appreciated.

The Official Action dated October 21, 2003, contained final rejections of all claims that have not been canceled or withdrawn from consideration. This Amendment is accompanied by the filing of a Request for Continued Examination (RCE), and therefore the finality of the rejections should therefore be vacated.

Applicant acknowledges the continuation of the election of species requirement. The Official Action indicates that Claims 1-3, 6 and 7 have been withdrawn from further consideration. Claims 8-10 are presented herein, with Claim 8 being presented in amended form. New Claims 11 and 12 are also presented, with Claim 11 depending from Claim 8 and Claim 12 depending from Claim 11.

Claim 8 stands rejected under 35 USC §103(a) as being unpatentable in view of the Kayser patent (US 3,138,942. Claims 8 and 10 stand rejected under 35 USC §103(a) in view of the Mangiavacchi patent (US 4,710,150). Claim 9 stands rejected under 35 USC §103(a) in view of either Kayser or Mangiavacchi, further in view of Takabe (US Published Application No. 2001/0007832).

Turning first to the rejection of Claim 8 in view of the Kayser patent, the Official Action asserts that all features and limitations of Claim 8 are disclosed by Kayser, with the exception of the rollers being so constructed and arranged to be movable by 0.6 mm or greater in an axial direction. The Official Action further asserts that such a feature would have been obvious to a person of ordinary skill in the art, as being a discovery of an optimum or workable range for the Kayser device. Without acceding to the rejection, Claim 1 has been amended to recite that the cross joint claimed therein is adapted to be used in a steering apparatus having an upper shaft and a lower shaft, with the joint including a pair of yokes and a cross-shaped spider shaft, with the cross joint serving to transmit a torque that rotates through a predetermined bending angle. The particular features and limitations set forth in Claim 8 and the claims depending therefrom are especially advantageous when used in a cross joint that is adapted to be employed in a steering apparatus.

The cross joint of Claim 8 calls for a needle bearing to be positioned in a bearing hole of each yoke, and for an end portion of a spider shaft being fitted into the bearing hole through the needle bearing. The claim further recites that the needle bearing includes a bearing cup and rollers in the bearing cup, with the rollers being interference-fitted on an end periphery of the end portion of the spider shaft extending through the rollers.

The Official Action states that Figs. 1 and 2 of Kayser show that the rollers 24 in the Kayser device are interference-fitted on an end periphery 27 of the end portion of the spider shaft 14 of Kayser. The text of the Kayser patent does not state that the rollers are interference-fitted, and therefore the reliance on the drawing figures amounts to an assertion that Kayser inherently discloses the use of an interference fit of the rollers onto the spider shaft/trunnion 14.

Inherency may not, however, be based on possibilities or probabilities. *Ex parte Skinner*, 2 USPQ2d 1788 (PTO Bd. App. 1986) An assertion that a feature is inherent in a prior art disclosure requires that, to a certainty, the feature is present in that disclosure. The term "interference fit" is a term of art that persons of ordinary skill in the art would understand to mean that the fitting requires force to assemble the components (e.g., a press fit), and that pressure is exerted between the components that are interference fitted once assembly is effected. Thus, the drawings of the Kayser patent, even if intended to illustrate that the needle bearings are immediately adjacent to the trunnion and the bearing cup, do not specifically disclose that the needle bearings are interference fitted to the trunnion.

As was discussed in the interview, Kayser mentions the use of an interference fit, but in a completely different context and for different components of the

universal joint. Kayser discloses that the metallic portion 38 of a seal is desirably interference fitted to the trunnion, yet is silent regarding any interference fitting of the needles to the trunnion. This is indicative that an interference fit is not present between the needles and the trunnion, and, in any event, the Kayser patent cannot be asserted to disclose, to a certainty, that the rollers are interference fitted to the trunnion.

The Applicant herein has further noted that, in the state of the art in cross joints, the needles are not interference fitted to the trunnion. At the interview, the Gall patent (US 4,874,349) was presented as providing inferential evidence in support of that position. Keeping in mind that an interference fit, as the term is understood in the art, requires the application of force to assemble the interference-fitted members, and that the components exert pressure on each other once assembled, the Gall patent includes several statements which indicate that the state of the art involving universal joints does not include interference fitting the needles of the bearings to the trunnions of the cross member. For example, the Gall patent states that:

[T]he bearing cups 20 and dust guards 30 are next assembled onto the trunnions 12 by inserting the open ends 20b of the bearing cups 20 over the open ends 12e of the trunnions 12. The bearing cups are then moved axially inwardly toward the body portion 11. Little frictional resistance is generated to such movement because the inner diameters of the dust guards 30 are larger than the outer diameters of both the outer bearing surfaces 12d and the sealing surfaces 12c of the

trunnions 12. Throughout such axial movement, the sealing lips 27a and 27b may brush across the outer bearing surfaces 12d of the trunnions 12, but do not sealingly engage such outer bearing surfaces.

Gall, US 4,874,349, Column 5, lines 10-22

Significantly, this passage which discusses assembling the bearing cups onto the trunnions, with the needles disposed in the bearing cups, discusses only contact of the dust guard 30 and the sealing lips 27a, 27b, of elastomeric seals 27 with the trunnion as the bearing cup is assembled onto the trunnion. The passage mentions that there is "[L]ittle frictional resistance" generated in the assembly, and that is caused by the dust guards and not the needles of the roller bearing. Yet the drawings show, as do the drawing of Kayser, that the needles are adjacent the trunnion once assembly is effected. This establishes that an interference fit between the needles of the roller bearing and the trunnion is not the state of the art in such universal joints or cross joints, and further that drawings such as those in the Kayser patent do not inherently disclose such a feature.

Kayser further identifies that external straps or other devices had generally been used to retain the bearing cups 30 on the trunnions 12 when shipping the cross members 10 for subsequent installation. (Column 5, lines 47-51) Kayser notes that the external straps or other retaining devices may be dispensed with, due to the provision of a dust guard sized to be interference fitted to the trunnion. Again, as in the Kayser patent, this is

not the needles of the needle bearing being discussed, but rather a dust guard disposed at the base of the bearing cap. That an interference fit of the dust guard to the trunnion is seen as an adequate measure to retain the bearing cap on the trunnion without the need for external straps indicates that there is not an interference fit of the needles to the trunnion.

It was asserted at the interview that the drawings of the Kayser patent (especially Fig. 2) show that the needles are in a position spaced above the lower seal, and that this was indicative that an interference fit was being inferred, in that the needles would otherwise slide down into contact with the seal. However, not only does Fig. 2 not specifically represent a particular orientation of the device (i.e., it cannot be inferred that gravity would be acting to urge the needle to slide downwardly, but there are at least two possible explanations as to why, even under the influence of gravity, the needle would be retained at a spacing from the seal.

Lubricant is present in the spacings in the joint once assembled, and the density and viscosity of the lubricant might well support the needles at the spaced position. Further, the Examiner called attention to a technique referred to as "Keystoning" (see, e.g., US 5,989,124), which has been used in mounting needle bearings into bearing cups. The technique appears to generally involve interference fitting the set of needles into the bearing cup (the interference fit being in a

circumferential direction) to maintain the bearings in position prior to the bearing cup being installed on a trunnion. It is possible that the needles in the Kayser patent remain suspended above seal (in opposition to gravitational forces) through some form of immobilization of the needles, such as Keystoning, that does not involve the trunnion in any way. In any event, the illustration of this spacing does not evidence conclusively that the Kayser patent inherently discloses that an interference fit exists between the needles and the trunnion.

As such, the Kayser patent does not disclose or suggest the interference fit aspect of the invention set forth in Claim 8.

Kayser further does not render obvious the limitation in Claim 8 that the rollers are movable by 0.6 mm or greater in an axial direction. As noted in the present specification, the use of this clearance for the rollers is, in the context of using the cross joint in a steering apparatus, and in the context of employing an interference fit between the rollers and the spider shaft, a feature which contributes to the smooth operation of the cross joint, which results in a smooth steering operation being felt and experienced by an operator of a vehicle. This degree of axial mobility generally prevents the rollers from contacting the upper and lower walls of the bearing cup, which generates a sliding contact that detracts from the smooth steering operation and feeling sought to be obtained. The bending

torque in the steering shaft is also reduced when such sliding contact is minimized or avoided.

The Kayser patent does not disclose that the universal joint therein is designed for use in a steering apparatus. Universal joints have numerous applications, including in vehicle drive trains. Thus it cannot be legitimately asserted that a person of ordinary skill in the art would, exerting only routine skill, discover the particular range of axial movement found to be advantageous in the cross joint of the present invention, which is adapted for use in a steering apparatus.

Kayser is also directed to a seal configuration for a universal joint, and persons of ordinary skill in the art working with the Kayser disclosure would thus be focused on optimizing the performance of the seal, and not on other aspect of the performance or operation of the universal joint disclosed therein.

Amended Claim 8 is patentable over the cited Kayser patent for at least the reasons set forth above. Withdrawal of the rejection of this claim under 35 USC §103(a) in view of Kayser is therefore warranted.

Claims 8 and 10 are asserted to be rendered obvious by the Mangiavacchi patent. The rejection, as does the rejection in view of Kayser, relies on an alleged disclosure of an interference fit between the rollers of a needle bearing and a trunnion, as purportedly evidenced by the drawing figure therein. For essentially the same reasons as are set forth above, the Mangiavacchi patent does not disclose that the rollers are interference-

fitted onto the trunnion/spider shaft of the device shown therein.

The Mangiavacchi patent also fails to disclose or suggest that the rollers are to be movable by 0.6mm or greater, as is also recited in Claim 8. The focus of the Mangiavacchi patent is on the seal means that is to be provided on the bearing cup. Thus, particular aspects of the design of the joint, such as the relationship of the rollers to the trunnion and to the bearing cup, are not addressed in the Mangiavacchi patent. It is only after considering the disclosure of the present invention that a person of ordinary skill in the art would recognize that an interference fit between the rollers and the spider shaft can advantageously be used in a cross joint, and further that providing a construction in which the rollers are axially movable by 0.6mm or more, will result in the provision of a cross joint that will produce a smooth, low noise, steering apparatus.

Claims 8 and 10 are thus patentable over the cited Mangiavacchi patent. Withdrawal of the rejection of these claims under 35 USC §103(a) is therefore respectfully requested.

The rejections of Claim 9 under 35 USC §103(a) in view of either Kayser or Mangiavacchi further in view of Takabe are also untenable. The Takabe patent fails to provide any teachings that make up for the above-noted shortcomings of the Kayser and Mangiavacchi patents, and thus no *prima facie* case of obviousness has been

established with respect to Claim 9. Withdrawal of the rejections of Claim 9 is thus appropriate.

New Claims 11 and 12 have been presented in this Amendment. Claim 11 recites that the interference between the rollers of the needle bearing and the spider shaft is less than or equal to 0.035 mm. Claim 12 recites that the interference is in a range of from 0.002 mm to 0.025 mm. Support for these limitations is found at page 20, lines 1-6 of the original specification. In the Substitute Specification filed September 2, 2003, the language appears at page 20, lines 4-11.

As discussed above, neither the Kayser patent nor the Mangiavacchi patent discloses the provision of an interference fit between the rollers of a needle bearing and a trunnion. The state of the art, as evidenced, *inter alia*, by the Gall patent (US 4,874,349), also does not disclose the use of interference fits between these elements. In the present invention, it was determined that, in obtaining a smooth steering feeling and operation in a steering apparatus, the interference is preferably maintained to be less than or equal to 0.035 mm, and is even more preferable in a range of 0.002 to 0.025 mm. None of the cited prior art disclosed or suggests these limitations, nor does the cited art contain any disclosure that would allow a person of ordinary skill in the art, through routine experimentation, to arrive at these features. Only after reading the present disclosure would the person skilled in the art come to appreciate the advantages provided by

the limitations set forth in Claims 11 and 12. The claims are thus clearly patentable over the cited art.

Applicant believes that all claims as now presented are in condition for allowance. Passage of the application to issue at an early date is earnestly solicited.

The Commissioner is hereby authorized to charge to Deposit Account 50-1165 any fees under 37 C.F.R. §§ 1.16 and 1.17 that may be required by this paper and to credit any overpayment to that account. If any extension of time is required in connection with the filing of this paper and has not been requested separately, such extension is hereby requested.

Respectfully submitted,

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